

***Fridericia nanningensis*, a new terrestrial enchytraeid species
(Oligochaeta) from southwestern China**

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Abstract.—*Fridericia nanningensis*, a new species from wetland soil of Nanhu Park, Nanning city, the capital of Guangxi Zhuang Autonomous Region in southwest China, is described. It is characterized by 2–4 chaetae per bundle, poorly-developed clitellar glands, slender, unbranched peptonephridia, and spermathecae with 2 ampullar diverticula, a deep constriction in the middle of the ampulla and one large ectal gland. It is closely related to the European species, *F. alata* Nielsen & Christensen, 1959 and the East European species, *F. tubulosa* Dózsa-Farkas, 1972 by the shape of peptonephridia and the undeveloped clitellar glands. It differs from *F. alata* by its shorter body length and fewer chaetae per bundle, its type of coelomocytes (type “c”), its deep constriction in the middle of the spermathecae ampulla and a larger ectal gland, and it differs from *F. tubulosa* by its pale epidermal glands, its more anterior origin of the dorsal vessel, a deep constriction in the middle of the spermathecae ampulla, shorter ectal duct, and only one ectal gland at the spermathecal orifice.

Since *Henlea ventriculosa* (d’Udekem, 1854) was first reported from Tibet by Stephenson (cited in Cernovsítov 1941), nearly 40 terrestrial enchytraeid species from China have been recorded (Chen 1959; Liang 1979; Xu 1989; Liang & Xie 1992; Wang 1999; Xie 1999a, 1999b; Xie 2000a; 2000b, 2000c, 2000d; Xie & Rota in press). In spite of these works, the terrestrial enchytraeids in the country are still poorly studied, and the investigated regions are mainly covered in the Changjiang (Yangtze) Basin and some localities of the northeastern regions. Concerning the southwestern region of China, however, no species have been reported. In 1992, a preliminary faunistic survey of terrestrial microdriles in Guangxi Zhuang Autonomous Region in China was carried out. Among the specimens collected, one species of *Fridericia* was recognized as a new species. Its description is given herein.

Methods

Enchytraeids were sampled from wetland soil of Nanhu Park (22°50’N, 108°15’E), Nanning city, the capital of Guangxi Zhuang Autonomous Region in southwest China and extracted by the wet-funnel method (O’Connor 1962). After observation in vivo, worms were fixed in 10% formalin. Whole worms were stained in borax carmine or paracarmin, dehydrated in an alcohol series and mounted in Canada balsam. Figures were drawn with a camera lucida. The types are deposited in the Specimen Room of Invertebrates, Institute of Hydrobiology, the Chinese Academy of Sciences, China.

Unless otherwise specified in the description, measurements of body dimensions and internal organs refer to whole-mounted specimens. The type of oesophageal appendages (“peptonephridia”, see Rüdiger & Westheide 2000) and nucleated coelom-

ocytes are defined according to Nielsen & Christensen (1959) and Möller (1971).

Fridericia nanningensis new species
Fig. 1A–E

Holotype.—Fully mature, whole-mounted specimen.

Type locality.—Nanhu Park (22°50'N, 108°15'E), Nanning city, wetland brown soil under grass roots, with little humus, pH 6.5, 15 Sep 1992, coll. Z. Xie and H. Wang.

Paratypes.—7 whole-mounted specimens, from type locality.

Other material examined.—Ca. 20 additional specimens were examined in vivo; they are preserved in 10% formalin, also from type locality, coll. Z. Xie and H. Wang.

Description.—Worms slender, somewhat sluggish. Live dimensions: length 7–9 mm, width of clitellum 230–250 μm . Preserved dimensions: length 3.5–6.5 mm ($n = 8$), width in IV 182–190 μm , 200–210 μm at clitellum, 160–170 μm in posterior segments. Segments 28–40 ($n = 8$). Epidermal gland cells pale in vivo, arranged transversely, 3–4 rows per segment. Chaetae straight, with distinct ental hook, 4 (usually 2–3 in II or III) per bundle anteriorly (ca. until XIV–XVI) and 2–3 posteriorly. The largest chaetae (outer pair) occurring in caudal segments, 48–54 μm long and ca. 5 μm thick. Head pore at 0/1, longitudinally elongate. Dorsal pores from VII onwards. Clitellum over XII–1/2XIII, clitellar glands poorly-developed, forming ca. 20–23 transverse rows.

Brain round posteriorly, 30–36 μm long and 22–26 μm wide. Three pairs of pharyngeal glands in IV–VI, all united dorsally and with distinct ventral lobes (Fig. 1A). Oesophageal appendages unbranched, slender, coiled (2–4 loops) in IV–V and ending in VI–VII in vivo and IV–V in fixed specimens (type “b”, sensu Nielsen & Christensen 1959) (Fig. 1A). Chylus cells in XIII–XV. Chloragogen cells not dense from V onwards. A ridge of tall hyaline cells on

intestinal floor of XIX–XXII ($n = 4$). Blood colourless. Dorsal vessel originating in XVII–XVIII. Nephridia from 6–7 onwards, 5 pairs before clitellum. Anteseptal part oval, 1.5–2 times as long as postseptale; postseptale oval, with efferent duct originating mid-ventrally (Fig. 1D). Nucleated coelomocytes oval, with regular outline, evenly granulated (type “c” sensu Möller 1971), 27–30 μm long in vivo and ca. 18–22 μm in fixed materials. Anucleate corpuscles discoid, 7–8 μm in size (Fig. 1B).

Seminal vesicles well-developed, dorsal, anterior distension extending to X, and posterior to XII. Sperm funnels cylindrical, ca. 160–180 μm long and 70–80 μm wide, with a narrower collar (Fig. 1C). Vasa deferentia confined to XII, irregularly coiled. Penial bulbs hemispherical in lateral view and nearly oblong in ventral view, with compact glandular mass, ca. 147 μm long, 42 μm wide, 38 μm high. No egg sac. Usually 2 mature eggs at one time.

Spermathecae in V, ental ducts short and communicating with oesophagus separately (Fig. 1E). Ampulla conical, with deep constriction in middle region, 100–105 μm long and 45–50 μm wide; carrying two sessile, oval diverticula (44–50 μm long and 25–30 μm wide). Spermatozoa scattered in lumen. Ectal ducts 154–160 μm long and 11–12 μm wide. One oval granular gland (ca. 18–20 μm) at each ectal opening.

Etymology.—Named “nanningensis” for the type locality.

Distribution and habitat.—Known only from Nanning City. At the type locality, it co-occurs with other enchytraeid taxa: *Achaeta brevivasa* Graefe, 1980, *Hemienchytraeus bifurcatus* Nielsen & Christensen, 1959, *Hemienchytraeus stephensoni* (Cognetti, 1927), *Enchytraeus atheatus* Wang, 1999, and *Marionina* sp. (immature).

Discussion

Among all known species of *Fridericia* with elongate and unbranched oesophageal appendages, the new species is most closely

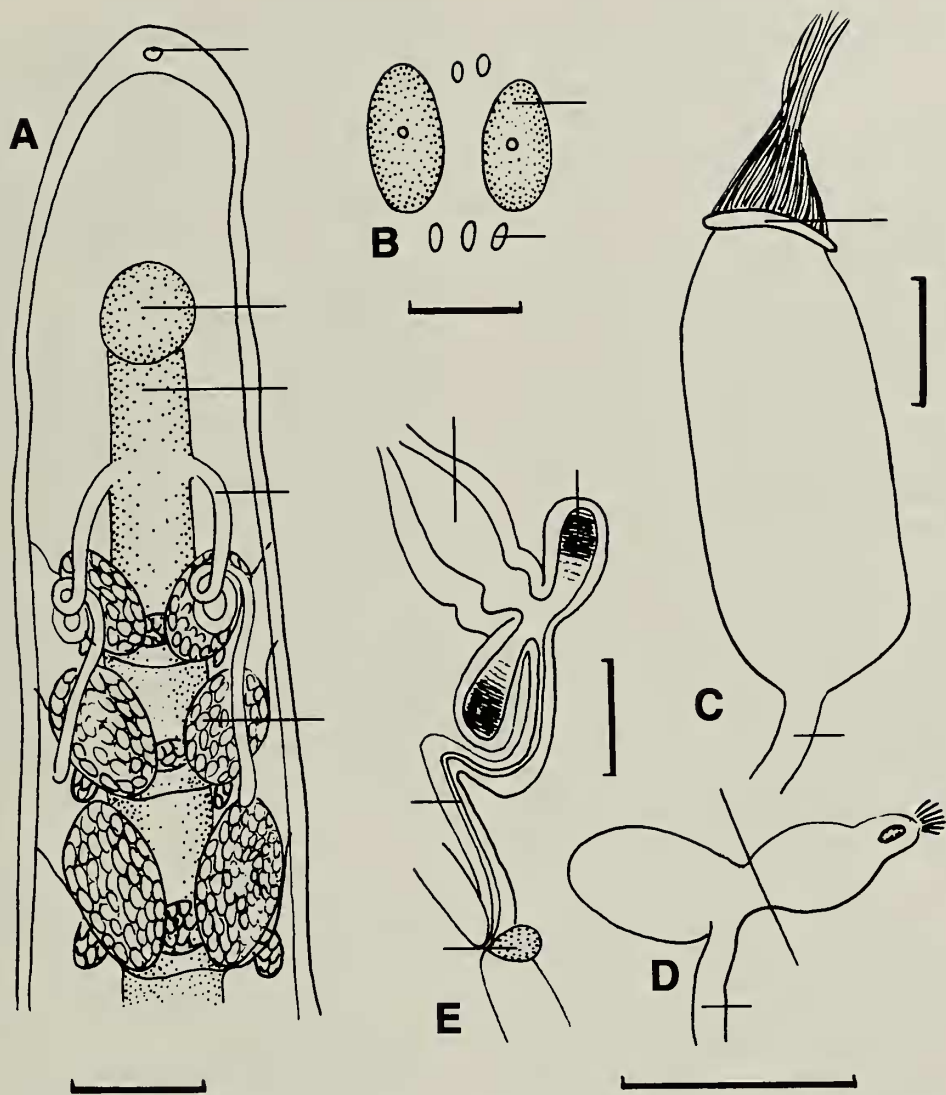


Fig. 1. *Fridericia nanningensis*, new species. A, Dorsal view of anterior segments; B, coelomocytes; C, sperm funnel; D, nephridium at $\frac{2}{3}$; E, spermatheca; Scale: A, 100 μm ; B, 20 μm ; C, D, E, 50 μm . Abbreviations: ac, anucleate corpuscle; co, collar; di, diverticulum; ed, efferent duct; end, ental duct; eg, ectal gland; hp, head pore; nc, nucleated coelomocyte; oe, oesophagus; oea, oesophageal appendage; ph, pharynx; phg, pharyngeal gland; sa, spermathecal ampulla; vd, vasa deferentia.

related to the European species, *Fridericia alata* Nielsen & Christensen, 1959 and the East European species, *Fridericia tubulosa* Dózsa-Farkas, 1972. They all have a poorly developed clitellum and two spermathecal diverticula. However, *F. alata* differs from *F. nanningensis* by having a longer body size (12–20 mm, 54–64 segments), up to 6

chaetae per bundle, longer ental ducts (Nielsen & Christensen 1959, Fig. 80), the type of coelomocytes (type "a"; Möller 1971), and a smaller ectal gland. *Fridericia tubulosa* differs from *F. nanningensis* by having longer body size (12–18 mm, 40–50 segments), yellowish or brownish epidermal glands, a relatively more posterior

Table 1.—Comparison of *Fridericia nanningensis*, new species, with allied species.

	<i>F. nanningensis</i> , new species	<i>F. alata</i> Nielsen & Christensen, 1959	<i>F. tubulosa</i> Dózsa-Farkas, 1972
Length (mm)	7–9	12–20	12–18
Segments	28–40	54–64	40–50
Chaetae/bundle	2–4	4–6	2–4
Clitellum	weakly developed	weakly developed	weakly developed
Epidermal glands	pale	indistinct	yellowish or brownish
Oesophageal appendages	type "b"	type "b"	type "b"
Origin of dorsal vessel	XVII–XVIII	ca. XX	XIX–XXIII
Efferent duct of nephridia	mid-ventral	mid-ventral	ventral
Nucleated coelomocyte	type "c"	type "a"	?
Sperm funnel (length: width)	2:1	2.5–3:1	3:1
Seminal vesicle	well-developed	well-developed	well-developed
Ectal duct: ampulla	1.5–1.6:1	6–6.5:1	2–2.5:1
Ampulla	constriction	no constriction	no constriction
Number of ectal glands at each spermathecal opening	1	1	2
Distribution	China	Europe	East Europe

origin of the dorsal vessel (XIX–XXIII), a longer ectal duct, and 2 conspicuous ectal glands at each spermathecal opening. The differences between these species are summarized in Table 1.

With the addition of *F. nanningensis*, a total of 12 species of *Fridericia* are known from the country (Table 2).

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Table 2.—Species of *Fridericia* previously recorded in China.

1. *Fridericia alba* Moore, 1895
2. *Fridericia bulboides* Nielsen & Christensen, 1959
3. *Fridericia bulbosa* (Rosa, 1887)
4. *Fridericia callosa* (Eisen, 1878)
5. *Fridericia carnichaeli* Stephenson, 1915
6. *Fridericia chongqingensis* Xie, 1999
7. *Fridericia maculata* Issel, 1904
8. *Fridericia multisegmentata* Wang, 1999
9. *Fridericia paraunistosa* Xie, 2000
10. *Fridericia paroniana* Issel, 1904
11. *Fridericia unisetosa* Xie, 2000

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